ADVANTEST

ADVANTEST CORPORATION

R3267 Series OPT74/79

Tracking Generator

Operation Manual

MANUAL NUMBER FOE-8335236C00

Applicable models

R3264
R3267
R3273

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Safety Summary

To ensure thorough understanding of all functions and to ensure efficient use of this instrument, please read the manual carefully before using. Note that Advantest bears absolutely no responsibility for the result of operations caused due to incorrect or inappropriate use of this instrument.

If the equipment is used in a manner not specified by Advantest, the protection provided by the equipment may be impaired.

- **Warning Labels**

  Warning labels are applied to Advantest products in locations where specific dangers exist. Pay careful attention to these labels during handling. Do not remove or tear these labels. If you have any questions regarding warning labels, please ask your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

  Symbols of those warning labels are shown below together with their meaning.

  DANGER: Indicates an imminently hazardous situation which will result in death or serious personal injury.

  WARNING: Indicates a potentially hazardous situation which will result in death or serious personal injury.

  CAUTION: Indicates a potentially hazardous situation which will result in personal injury or a damage to property including the product.

- **Basic Precautions**

  Please observe the following precautions to prevent fire, burn, electric shock, and personal injury.

  - Use a power cable rated for the voltage in question. Be sure however to use a power cable conforming to safety standards of your nation when using a product overseas.
  - When inserting the plug into the electrical outlet, first turn the power switch OFF and then insert the plug as far as it will go.
  - When removing the plug from the electrical outlet, first turn the power switch OFF and then pull it out by gripping the plug. Do not pull on the power cable itself. Make sure your hands are dry at this time.
  - Before turning on the power, be sure to check that the supply voltage matches the voltage requirements of the instrument.
  - Be sure to plug the power cable into an electrical outlet which has a safety ground terminal. Grounding will be defeated if you use an extension cord which does not include a safety ground terminal.
  - Be sure to use fuses rated for the voltage in question.
  - Do not use this instrument with the case open.
  - Do not place objects on top of this product. Also, do not place flower pots or other containers containing liquid such as chemicals near this product.

- When the product has ventilation outlets, do not stick or drop metal or easily flammable objects into the ventilation outlets.
- When using the product on a cart, fix it with belts to avoid its drop.
- When connecting the product to peripheral equipment, turn the power off.

- **Caution Symbols Used Within this Manual**

Symbols indicating items requiring caution which are used in this manual are shown below together with their meaning.

DANGER: Indicates an item where there is a danger of serious personal injury (death or serious injury).

WARNING: Indicates an item relating to personal safety or health.

CAUTION: Indicates an item relating to possible damage to the product or instrument or relating to a restriction on operation.

- **Safety Marks on the Product**

The following safety marks can be found on Advantest products.

: ATTENTION - Refer to manual.

: Protective ground (earth) terminal.

: DANGER - High voltage.

: CAUTION - Risk of electric shock.

- **Replacing Parts with Limited Life**

The following parts used in the instrument are main parts with limited life.
Replace the parts listed below before their expected lifespan has expired to maintain the performance and function of the instrument.
Note that the estimated lifespan for the parts listed below may be shortened by factors such as the environment where the instrument is stored or used, and how often the instrument is used.
The parts inside are not user-replaceable. For a part replacement, please contact the Advantest sales office for servicing.

There is a possibility that each product uses different parts with limited life. For more information, refer to Chapter 1.

Main Parts with Limited Life

Part name	Life
Unit power supply	5 years
Fan motor	5 years
Electrolytic capacitor	5 years
LCD display	6 years
LCD backlight	2.5 years
Floppy disk drive	5 years
Memory backup battery	5 years

- **Hard Disk Mounted Products**

The operational warnings are listed below.

- Do not move, shock and vibrate the product while the power is turned on.
  Reading or writing data in the hard disk unit is performed with the memory disk turning at a high speed. It is a very delicate process.

- Store and operate the products under the following environmental conditions.
  An area with no sudden temperature changes.
  An area away from shock or vibrations.
  An area free from moisture, dirt, or dust.
  An area away from magnets or an instrument which generates a magnetic field.

- Make back-ups of important data.
  The data stored in the disk may become damaged if the product is mishandled. The hard disc has a limited life span which depends on the operational conditions. Note that there is no guarantee for any loss of data.

- **Precautions when Disposing of this Instrument**

When disposing of harmful substances, be sure dispose of them properly with abiding by the state-provided law.

Harmful substances: (1) PCB (polycarbon biphenyl)
(2) Mercury
(3) Ni-Cd (nickel cadmium)
(4) Other
Items possessing cyan, organic phosphorous and hexadic chromium and items which may leak cadmium or arsenic (excluding lead in sol der).

Example: fluorescent tubes, batteries

Environmental Conditions

This instrument should be only be used in an area which satisfies the following conditions:

- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations

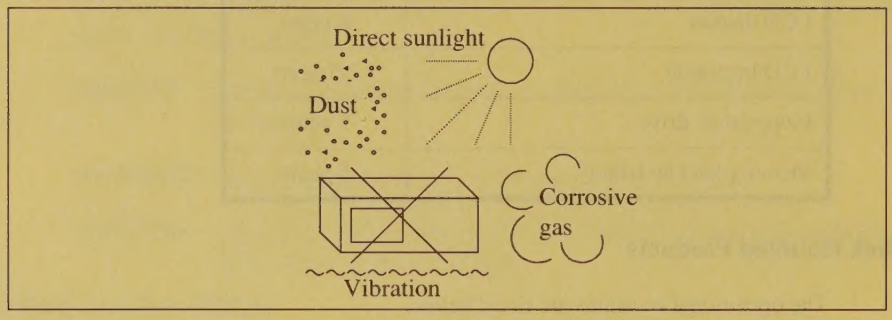

Figure-1 Environmental Conditions

- Operating position

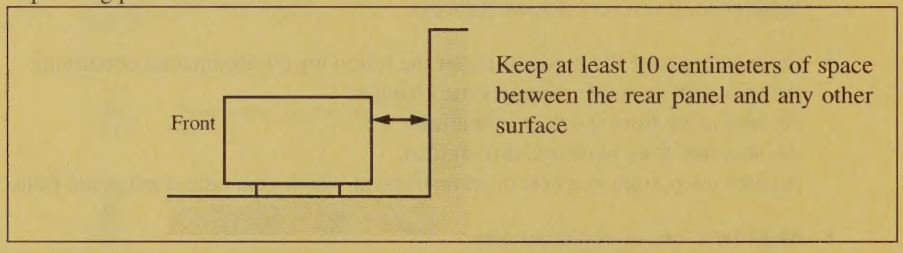

Figure-2 Operating Position

- Storage position

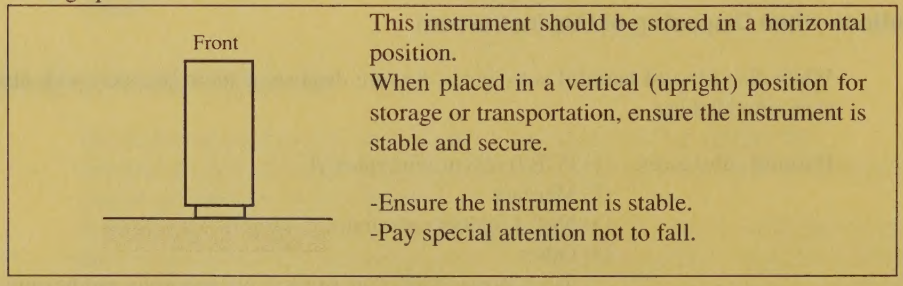
Front
This instrument should be stored in a horizontal position.
When placed in a vertical (upright) position for storage or transportation, ensure the instrument is stable and secure.
-Ensure the instrument is stable.
-Pay special attention not to fall.

Figure-3 Storage Position

This instrument can be used safely under the following conditions:

- Altitude of up to 2000 m
- Installation Categories II
- Pollution Degree 2

PREFACE

This manual provides the information necessary to check functionality, operate and program the R3267 Series Option 74/79, tracking generator.

(1) Organization of this manual

This manual consists of the following chapters:

Safety Summary	To use the analyzer safely, be sure to read this manual first.
1. Introduction • Product Description (Option) • Accessories • Operating Environment • About Calibration • System Checkout • Parts With a limited life • Cleaning, Storing and Transporting the Instrument	Includes a description of the option and its' parts and a self test error.
2. Operation • Description of the front panel • Measurement Examples	You can learn the basic operations of the option through the examples shown in this chapter.
3. Reference • Menu Index • Menu Map • Functional Description	Shows a list of operation keys, and describes the function of each key.
4. Remote Control • GPIB	Included are a list of commands necessary for programming.
5. Performance and Verification	Describes how to test this option.
6. Specifications	Shows the specifications of the option.
APPENDIX A.1 Error Messages	If an error occurs during operation, an error number and its corresponding error message are displayed. The meaning of each error is explained in this section.

(2) Typeface conventions used in this manual

- Panel keys and soft keys are printed in a contrasting typeface to make them stand out from the text as follows:

  Panel keys: Boldface type — Example: **FREQ, TG**
  Soft keys: Boldface and italic type — Example: ***Center, Detector***

- When a series of key operations are described using a comma between two keys.
- There are various soft menus used to switch between two states such as ON/OFF and AUTO/MNL.
  For example, when turning off the ***Display ON/OFF*** function, the annotation "***Display ON/OFF***(OFF)" is used.
  When switching the ***RBW AUTO/MNL*** function to MNL, the annotation "***RBW AUTO/MNL***(MNL)" is used.

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1 INTRODUCTION

This chapter provides the following information:

- Product description(Option)
- A list of accessories
- Operating environment
- System Checkout
- About Calibration
- Parts With a limited Life
- Cleaning, Storing and transporting the Instrument

1.1 Product Description

The Tracking Generator option (OPT74/79) is designed to enhance the R3267 Series Spectrum Analyzer's capability of measuring the amplitude-frequency characteristics and the amplitude linearity characteristics of DUTs. This option provides the user with a sinusoidal wave signal that is in sync with the sweep frequency of the R3267 Series Spectrum Analyzer.

This option is a factory option which is incorporated into the R3267 Series Spectrum Analyzer prior to shipment.

The key features of the option are listed below:

- Measuring frequency range: 100 kHz to 3.6 GHz
- Output amplitude range: 0 to -50 dBm (for OPT 74); 0 to -10 dBm (for OPT 79)
- Output power sweep function: 0 to 10 dB

1.2 Accessories

Table 1-1 lists the standard accessories shipped with the analyzer. If any of the accessories are damaged or missing, contact a sales representative. Order new accessories by type name.

Table 1-1 Standard Accessories List

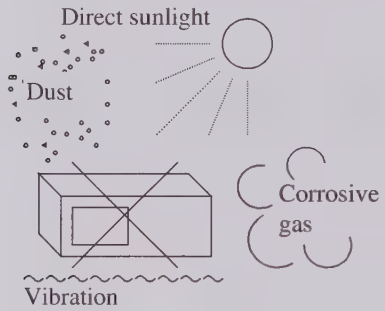
Name of accessory	Type name	Quantity	Remarks
N-BNC through connector	JUG-201A/U	1	
R3267 Series OPT74/79 Operation manual	ER3267/73 OPT74/79	1	English

1.3 Environmental Conditions

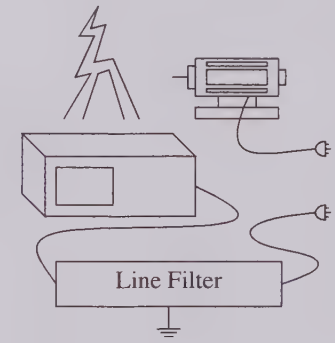
The analyzer should be only be used in an area which satisfies the following conditions:

- Ambient temperature: 0°C to +50°C (operating temperature)
- Relative humidity: 85% or less (without condensation)
- An area free from corrosive gas
- An area away from direct sunlight

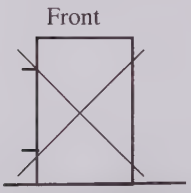
- A dust-free area
- An area free from vibrations
- A low noise area
  Although the analyzer has been designed to withstand a certain amount of noise riding on the AC power line, it should be used in an area of low noise. Use a noise cut filter when ambient noise is unavoidable.
- An area allowing unobstructed air flow
  There is an exhaust cooling fan on the rear panel and exhaust vents on both sides and the bottom (toward the front) of the analyzer. Never block the fan and these vents.
  Keep the rear panel 10 centimeters away from the wall. In addition, do not use the analyzer upright turned the front panel side down. The resulting internal temperature rise will affect measurement accuracy.



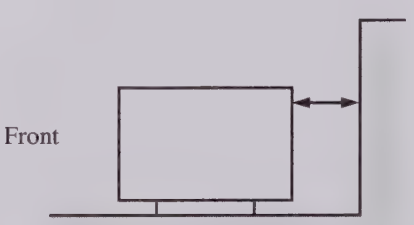
- Avoid operation in the following areas.



- Use a noise cut filter when there is a large amount of noise riding on the power line.



- Do not use the analyzer upright with the front panel down.



- Keep the rear panel 10 centimeters away from the wall

Figure 1-1 Operating Environment

The R3267 Series can be used safely under the following conditions:

- Altitude of up to 2000 m
- Installation Categories II
- Pollution Degree 2

CAUTION: ***The TG OUTPUT connector is used only for outputting the signal. To prevent damage, never apply a DC or AC voltage, or static electricity from the outside.***

1.4 System Checkout

This section describes the Selftest which must be performed when operating the analyzer for the first time. Follow the procedure below:

1. Check to see that the **POWER** switch (on the front panel) and the **MAIN POWER** switch (on the rear panel) are turned off.

2. Connect the power cable provided to the AC power supply connector on the rear panel.

CAUTION: ***To prevent damage, operate the analyzer within specified input voltage and frequency ranges.***

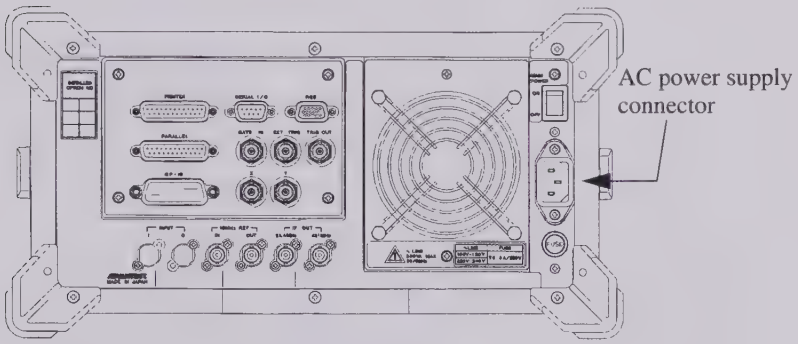


Figure 1-2 Connecting the Power Supply Cable

3. Connect the power cable to the outlet.

4. Turn on the **MAIN POWER** switch (on the rear panel).

5. Turn on the **POWER** switch (on the front panel).
   The analyzer performs the Initial test (processing time: approximately 10 seconds). The start-up screen is displayed as shown in Figure 1-3.

NOTE:

1. ***There is a possibility that the screen display is different from the one shown in Figure 1-3, depending on previously saved conditions.***
2. ***An error message will be displayed when an abnormal condition is detected. Refer to the list of error messages to solve the problem (Refer to Section A.1).***

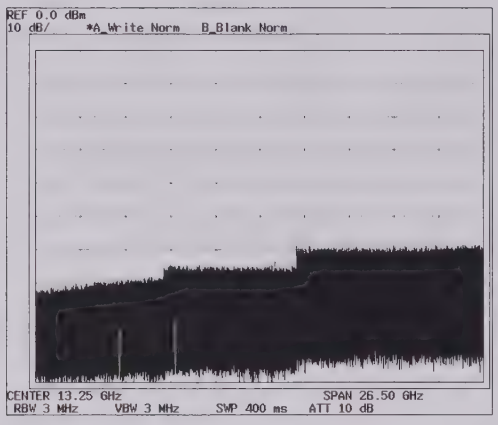


Figure 1-3 Start-up Screen

6. Attach the N-BNC adapter to the **INPUT** connector on the front panel and connect the Input cable from the **CAL OUT** connector to the **INPUT** connector.

7. Press **SHIFT**.
   The SHIFT lamp lights.

8. Press **CONFIG(PRESET)**.
   The default settings have now been reset.
   The start-up screen is displayed as shown in Figure 1-3.

9. Press **CONFIG**.
   The Config menu is displayed.

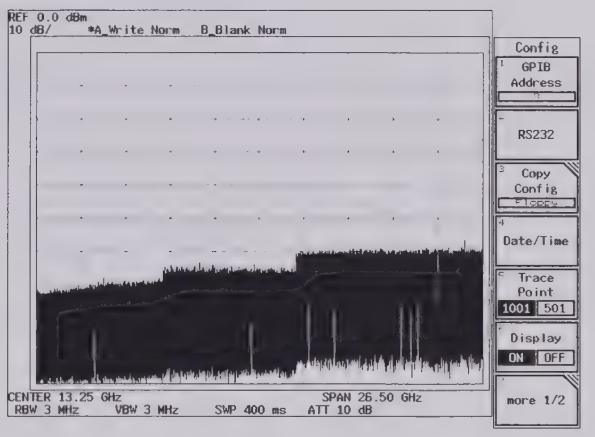


Figure 1-4 Config Menu

10. Press ***more 1/2*** and ***Selftest***.
    The Selftest menu is displayed.

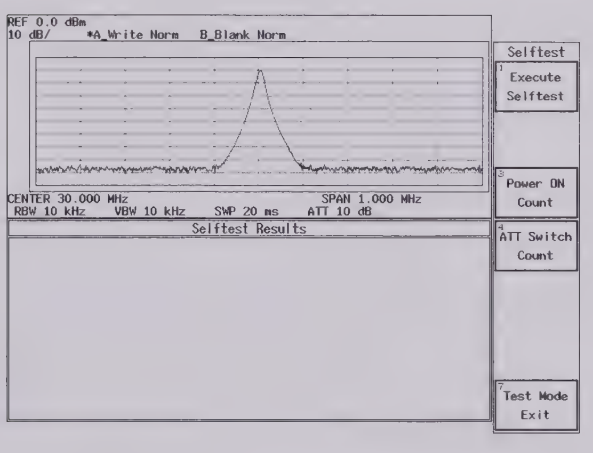

REF 0.0 dBm
10 dB/ *A_Write Norm B_Blank Norm
CENTER 30.000 MHz SPAN 1.000 MHz
RBW 10 kHz VBW 10 kHz SWP 20 ms ATT 10 dB
Selftest Results
Selftest
1 Execute Selftest
3 Power ON Count
4 ATT Switch Count
7 Test Mode Exit

Figure 1-5 Selftest Menu

11. Press ***Execute Selftest***.
    The selftest consisting of following items is executed in sequence and the result is displayed.

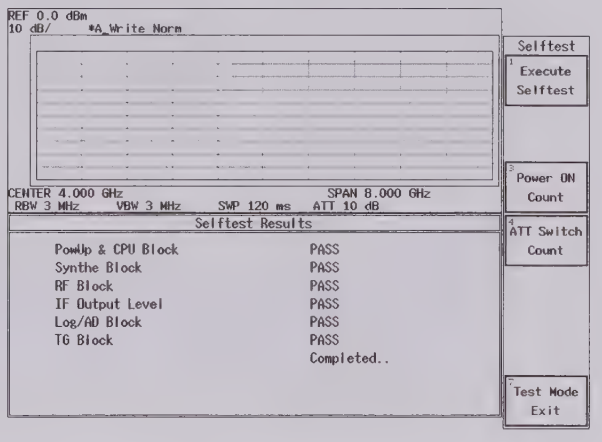


Figure 1-6 Selftest Result

NOTE: If the Selftest detects any errors, do not attempt to use the analyzer any further. Contact a sales representative as soon as possible. If the selftest is executed without a calibration signal, it fails, so make sure to supply the calibration signal.

12. Press ***Test Mode Exit*** or **RETURN**.

This completes the system checkout.

1.5 About Calibration

When you want to calibrate the R3267 Series, please contact a sales representative.

Desirable Period	One year

1.6 Concerning Limited-life Parts

The parts listed below must be replaced after the period of time indicated.

Part Name	Approximate Life	Description
Output attenuator (OPT74 only)	2 million times	When the error message "TG Level Cal failed. Check connection between TG OUTPUT and INPUT." (under the message code "311") is displayed, run the user selftest. If the TG BLOCK error occurred during the user selftest, contact a sales representative.

1.7 Cleaning, Storing and Transporting the Analyzer

1.7.1 Cleaning

Remove dust from the outside of the analyzer by wiping or brushing the surface with a soft cloth or small brush. Use a brush to remove dust from around the panel keys. Hardened dirt can be removed by using a cloth which has been dampened in water containing a mild detergent.

CAUTION:

1. ***Do not allow water to get inside the analyzer.***
2. ***Do not use organic cleaning solvents, such as benzene, toluene, xylene, acetone or similar compounds, since these solvents may damage the plastic parts.***
3. ***Do not use abrasive cleaners.***

1.7.2 Storing

Store the analyzer in an area which has a temperature from -20°C to +60°C. If you plan to store the analyzer for a long period (more than 90 days), put the analyzer in a vapor-barrier bag with a drying agent and store the analyzer in a dust-free location out of direct sunlight.

1.7.3 Transporting

When you ship the analyzer, use the original container and packing material. If the original packaging is not available, use the following repackaging guidelines:

1. To allow for cushioning, use a corrugated cardboard container that is at least 15 centimeters larger than those of the analyzer.
2. Surround the analyzer with protective sheeting.
3. Cushion the analyzer on all sides with packing material.
4. Seal the corrugated cardboard container with shipping tape or an industrial stapler.

If you are shipping the analyzer to a sales representative for service or repair, attach a tag to the analyzer that shows the following information:

- Owner and address
- Name of a contact person at your location
- Serial number of the analyzer (located on the rear panel)
- Description of the service requested

2 OPERATION

This chapter describes the following.

- Description on the front panel
- Measurement examples

2.1 Description of the Front Panel

For names, functions and screen annotations of the front panel, refer to Section 2.1, "Panel Description" in the R3267 Series Spectrum Analyzer Operation Manual.
The TG OUTPUT connector and the TG key used to set the tracking generator are now available for analyzers that have the Tracking Generator option installed.

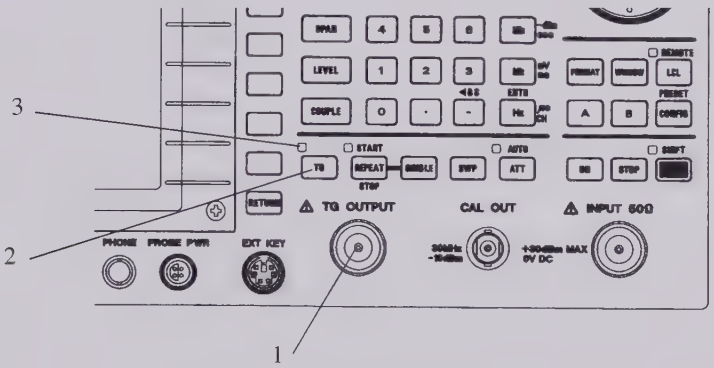


Figure 2-1 Front Panel

1. TG OUTPUT connector — Outputs the TG signal.

CAUTION: ***The TG OUTPUT connector is used only for outputting the signal. To prevent damage, never apply a DC or AC voltage, or static electricity from the outside.***

---

2. TG key — Turns on the tracking generator function.
3. TG lamp — Lit when the TG function enables.

2.2 Measurement Examples

2.2.1 Measuring DUT's Amplitude-frequency Characteristics

This section describes how the tracking generator is used through a practical example of measuring the amplitude-frequency characteristics.

Setup

1. Connect the measurement cables as shown in Figure 2-2.

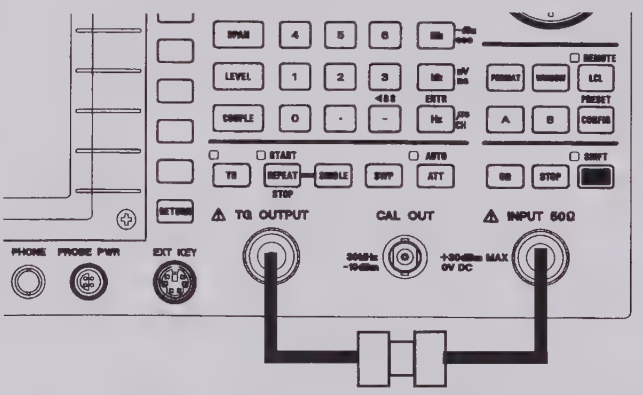


Figure 2-2 Setup for the Amplitude-frequency Characteristics Measurement

Setting the measurement conditions

This changes the analyzer settings so that the input signal is displayed more clearly.

2. Press **FREQ, 1, ., 8** and **GHz**.
   A center frequency of 1.8 GHz is set.

3. Press **SPAN, 3, ., 6** and **GHz**.
   A span frequency of 3.6 GHz is set.

4. Press **LEVEL, 1, 0** and **GHz(+dBm)**.
   The reference level is set to +10 dBm.

5. Press **TG,** ***Output Level*****, 0** and **MHz(-dBm)**.
   The tracking generator output is turned on, a output level is set to 0 dBm.

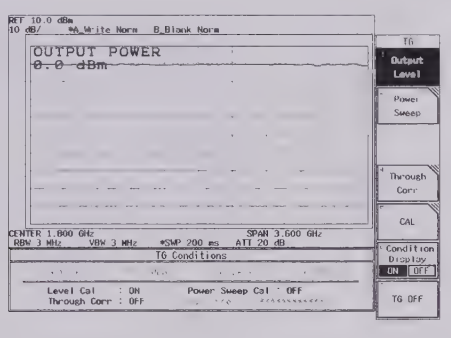


Figure 2-3 Measurement System Frequency Characteristics

Compensating the frequency characteristics of the measurement system

6. Press **A, *more 1/2*** and ***Normalize A***.
   Normalize A menu is displayed.

7. Press ***Display Line Pos*, 0** and **MHz(-dBm)**.
   The display line is set to 0 dBm.

8. Press ***Normalize with Store Corr*** and ***Normalize A ON/OFF***(ON).
   Compensating the frequency characteristics of the measurement system in reference to the display line.

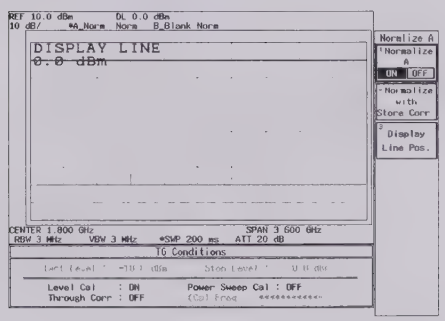


Figure 2-4 Compensating Measurement System's Frequency Characteristics

Measuring DUT's amplitude-frequency characteristic

9. Connect the measurement cables as shown in Figure 2-5
   DUT's amplitude-frequency characteristics are displayed on the spectrum analyzer screen as shown in Figure 2-6.

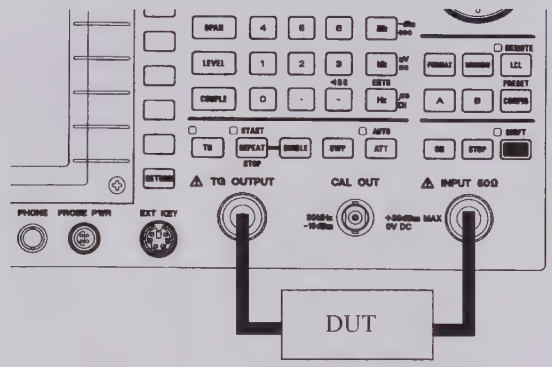


Figure 2-5 Connecting DUT

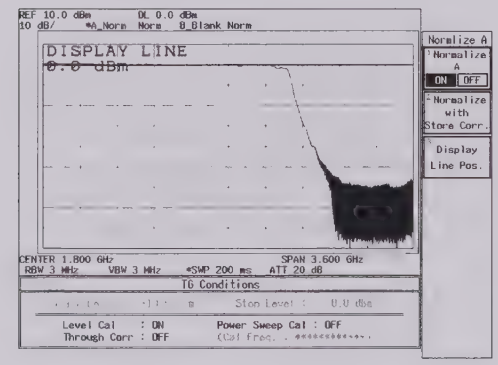


Figure 2-6 Measuring DUT's Amplitude-frequency Characteristics

3 REFERENCE

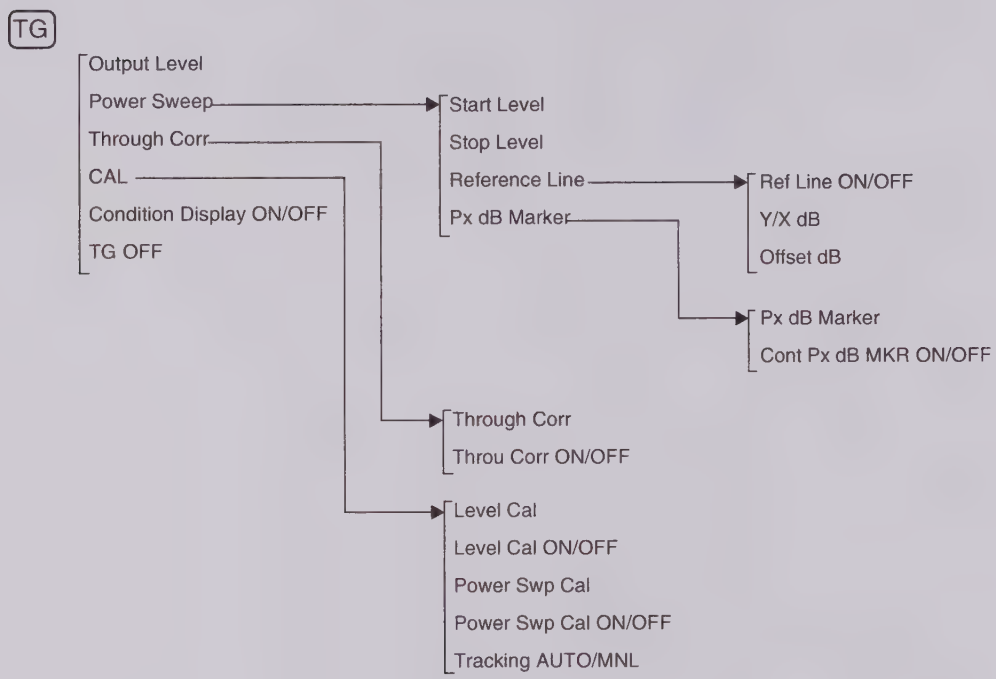
This chapter describes the operating keys used with the tracking generator.

3.1 Menu Index

This menu index is used to easily find the keys described in Chapter 3.

Operation Key	Pages
CAL	3-2, 3-4
Condition Display ON/OFF	3-2, 3-5
Cont Px dB MKR ON/OFF	3-2, 3-3
Level Cal	3-2, 3-4
Level Cal ON/OFF	3-2, 3-4
Offset dB	3-2, 3-3
Output Level	3-2, 3-3
Power Sweep	3-2, 3-3
Power Swp Cal	3-2, 3-4
Power Swp Cal ON/OFF	3-2, 3-5
Px dB Marker	3-2, 3-3
Ref Line ON/OFF	3-2, 3-3
Reference Line	3-2, 3-3
Start Level	3-2, 3-3
Stop Level	3-2, 3-3
TG Key (Tracking Generator Function)	3-3
TG OFF	3-2, 3-5
Throu Corr ON/OFF	3-2, 3-4
Through Corr	3-2, 3-4
Tracking AUTO/MNL	3-2, 3-5
Y/X dB	3-2, 3-3

3.2 Menu Map


TG
Output Level
Power Sweep
Through Corr
CAL
Condition Display ON/OFF
TG OFF
Start Level
Stop Level
Reference Line
Px dB Marker
Ref Line ON/OFF
Y/X dB
Offset dB
Px dB Marker
Cont Px dB MKR ON/OFF
Through Corr
Throu Corr ON/OFF
Level Cal
Level Cal ON/OFF
Power Swp Cal
Power Swp Cal ON/OFF
Tracking AUTO/MNL

3.3 Functional Description

For the R3267 Series with the Tracking Generator (TG) option (OPT74/79) installed, the following soft menus are available when the TG key (on the front panel) is pressed.

3.3.1 TG key (Tracking Generator Function)

TG Key Turns the TG output on, and allows you to use the soft menus used in the TG function.

Output Level Sets the TG output level.

Power Sweep Turns the output power sweep on, and displays the power sweep setting menu.

- ***Start Level*** Sets the start level of the output power sweep.
- ***Stop Level*** Sets the stop level of the output power sweep.
- ***Reference Line*** Sets Reference Line used as the baseline of power linearity measurements.
  - ***Ref Line ON/OFF*** Sets whether or not Reference Line is displayed.
    - ON: Displays Reference Line.
    - OFF: Does not display Reference Line.
  - ***Y/X dB*** Sets the gradient of Reference Line.
  - ***Offset dB*** Sets the offset value of Reference Line.
- ***Px dB Marker*** Searches for a point on the measured waveform x dB below Reference Line, and displays the marker at this point.
  - ***Px dB Marker*** Performs Px dB Search for the currently displayed waveform.
  - ***Cont Px dB MKR ON/OFF***
    Sets whether or not Px dB MKR is continuously executed.
    - ON: Continuously executes Px dB MKR for each sweep.
    - OFF: Does not execute Px dB MKR continuously for each sweep.

Through Corr Displays the Through Correction menu. This is the Normalize function which keeps track of any changes in the frequency setting. Normalize is performed in the frequency range between 100 kHz and 3.6 GHz.

NOTE: ***From this moment onward, the Normalize function is no longer required, because the normalization data is automatically interpolated according to the measurable frequency range setting.***

Through Corr After the data for Through Correction has been acquired, Through Corr is turned on.

Throu Corr ON/OFF Sets whether or not Through Correction is turned on.

NOTE: ***This function cannot be turned on when Through Corr is not executed.***

ON: Turns Through Correction on.

OFF: Turns Through Correction off.

CAL Displays the output level calibration, Power Sweep Calibration and the menu used for frequency tracking adjustments.

Level Cal Measures the error in the TG output level and calibrates it (referred to as Level Calibration)

Level Cal ON/OFF Selects whether or not the calibration factor, which is obtained with the Level Cal function, is used.

NOTE: ***This function cannot be turned on when Through Corr is not executed.***

ON: Uses the level calibration factor. However, this function is not turned on if Level Cal is not in process.

OFF: Does not use the level calibration factor.

Power Swp Cal Measures the error in the power sweep level at the currently set frequency (referred to as Power Sweep Calibration).

Power Swp Cal ON/OFF Sets whether or not the calibration factor obtained from Level Calibration is used.

NOTE: ***The following two conditions must be met: Power Swp Cal is in process, and the frequency setting which was used when Power Swp Cal was executed and the one currently used are the same.***

ON: Uses the power sweep calibration factor.

OFF: Does not use the power sweep calibration factor.

Tracking AUTO/MNL Toggles the tracking mode between AUTO and MNL.

AUTO: Automatically sets the frequency tracking. TG output frequency is automatically adjusted, so it becomes the same as the spectrum analyzer's tuned frequency.

OFF: Manually turns the frequency tracking. This mode allows you to manually set TG output frequency offset based on the spectrum analyzer's tuned frequency. You can manually set TG output frequency offset for each resolution bandwidth (RBW).
Adjustable range of TG output frequency offset is between {-100 (% x RBW)} and {+100 (% x RBW)}.

Condition Display ON/OFF Sets whether or not TG setting parameters is displayed.

ON: Displays TG setting parameters.

OFF: Does not display TG setting parameters.

TG OFF Turns the tracking generator off.

4 REMOTE CONTROL

4.1 GPIB Command Index

This GPIB command index can be used as the index for Chapter 4.

Operation Key	Pages
ATADJ	4-3
CPXDB OFF	4-2
CPXDB ON	4-2
FNRM	4-2
FNRM OFF	4-2
FNRM ON	4-2
LCAL	4-2
LCAL OFF	4-2
LCAL ON	4-2
PCAL	4-3
PCAL OFF	4-3
PCAL ON	4-3
PSPL	4-2
PSTL	4-2
PSWP OFF	4-2
PSWP ON	4-2
PXDB	4-2
RLIN OFF	4-2
RLIN ON	4-2
RLOFS	4-2
TADJ	4-3
TG OFF	4-2
TG ON	4-2
TGCDSP OFF	4-3
TGCDSP ON	4-3
TGF	4-2
TGL	4-2
XYR	4-2

4.2 GPIB Command Codes

The following tables list the GPIB commands by function.

Listener Code Column: An asterisk (*) in the Listener Code Column indicates that the function requires numeric data together with the function code.
The sign [*] in the Listener Code Column indicates that the function can be omitted.
String data such as file name, label and so on can receive characters, which are found after the command and prior to the delimiter, as input values. However, when data begins with a "/", the characters between "/" and "/" are received as input.

Output Format Column: A comma (,) in the Output Format column indicates that multiple items are output.
ON/OFF or AUTO/MANUAL in the Output Format column indicates that the code outputs 1 or 0, respectively.
All frequencies are in hertz (Hz), and all times are in seconds. Levels are output in the currently displayed unit.

Table 4-1 TG Key (Tracking Generator function) (1 of 2)

Function		Listener Code	Talker Request		Remarks
			Code	Output Format	
Tracking Generator	ON	TG ON	TG?	0:OFF	
	OFF	TG OFF		1:ON	
		TGF			
Output Level		TGL *	TGL?	Level	
Power Sweep	ON	PSWP ON	PSWP?	0:OFF	
	OFF	PSWP OFF		1:ON	
Start Level		PSTL *	PSTL?	Level	
Stop Level		PSPL *	PSPL?	Level	
Reference Line	ON	RLIN ON	RLIN?	0:OFF	
	OFF	RLIN OFF		1:ON	
Y/X dB		XYR *	XYR?	Y/X Ratio value	
Offset dB		RLOFS *	RLOFS?	Offset level	
Px dB Marker Level		PXDB [*]	PXDB?	Level	
Cont Px dB Marker	ON	CPXDB ON	CPXDB?	0:OFF	
	OFF	CPXDB OFF		1:ON	
Through Correct execution		FNRM			
Through Correct	ON	FNRM ON	FNRM?	0:OFF	
	OFF	FNRM OFF		1:ON	
Level Cal execution		LCAL			
Level Cal	ON	LCAL ON	LCAL?	0:OFF	
	OFF	LCAL OFF		1:ON	

Table 4-1 TG Key (Tracking Generator function) (2 of 2)

Function		Listener Code	Talker Request		Remarks
			Code	Output Format	
Power Sweep execution		PCAL			
Power Sweep Cal	ON	PCAL ON	PCAL?	0:OFF	
	OFF	PCAL OFF		1:ON	
Tacking Adjust	MANUAL	TADJ *	TADJ?	Adjusted value	
	AUTO	ATADJ	ATADJ?	0:MANUAL	
				1:AUTO	
Condition Display	ON	TGCDSP ON	TGCDSP?	0:OFF	
	OFF	TGCDSP OFF		1:ON	

5 PERFORMANCE VERIFICATION

This chapter describes how to test the tracking generator used with the R3267 Series. For your convenience, we recommend that you use the performance check sheet in section 5.3. When some problems occur with the R3267 Series, make ADVANTEST service center a request for repairs by transporting the instrument (for transportation, refer to 1.7.3 Transporting) with the measurement data filled in on the performance check sheet.

NOTE: After warming up the analyzer, perform the CAL ALL before starting this performance verification tests.

5.1 Instrument Used and Associated Standards

This chapter shows a list of the instruments used for the performance verification tests.

NOTE

1. *The R3267 Series to be tested should be warmed up for at least 30 minutes before starting tests. Any additional instrument used for this performance verification tests should be warmed up as appropriate.*
2. *Make sure that the test instrument used meets its own published specifications and that all connectors are clean, before starting test. All connectors should be firmly connected.*

Table 5-1 Instruments Required

No.	Instruments	Specification	Recommended models	Quantity
1	Power meter Power sensor	Frequency range: 10 MHz to 26.5 GHz Measurement range: 1μW to 100 mW Max. SWR: 1.25 (26.5 GHz)	NRVS NRV-Z52 Rohde&Schwarz	1
2	Spectrum Analyzer	Frequency range: 100 Hz to 8.0 GHz Measurement range: +10 dBm to -110 dBm	R3267 ADVANTEST	1
3	Terminator	Impedance: 50Ω Connector: N(m)	RNA Rohde&Schwarz	2
4	RF Cable	Impedance: 50Ω Connector: SMA(m)-SMA(m) Frequency range: DC to 26.5 GHz Max. SWR: < 1.45 (26.5 GHz) Length: approx. 0.7 m	A01002 ADVANTEST	1
5	Adapter	N(m)-SMA(f)		2

5.2 Procedure

This section describes the method of how to carry out the performance verification of the R3267 Series.

---

*NOTE: **In the following procedure, the values used are for the recommended instruments.***
When using other instruments, use the values conforming to the specifications of each instrument.

5.2.1 Output Level Flatness

This section describes how to check the TG (Tracking Generator) output level flatness.
Connect the power sensor to the TG output connector to obtain the output frequency-level characteristics of the tracking generator.

Specifications: < ±3 dB (at 100 kHz to 3.6 GHz, -10 dBm output, and relative value)

Instruments Required

Instruments	QTY	Recommended Model
Power meter / Power sensor	1	NRVS / NRV-Z52
Adapter N(m)-SMA(f)	1	

Initializing the power meter

1. Set the display mode of the NRVS to dBm.
2. Perform the zeroing on the NRVS.

Setup

3. Connect the power sensor to TG OUTPUT using the adapter.

Initialization

4. Press **SHIFT** and **CONFIG(PRESET)**.

Setting the measurement conditions

5. Press **TG, *Output Level*, 1, 0** and **MHz(-dBm)**.
6. Press **SPAN, 0** and **MHz**.
7. Press **FREQ, 0** and **MHz**.
8. Press **FREQ, *CF Step Size AUTO/MNL***(MNL), **3, 0, 0** and **MHz**.

Measurements

9. Press **FREQ** and △.
10. Set the center frequency of the analyzer to the NRVS correction frequency.
11. Fill in the performance check sheet. With the power level measured by the NRVS.
12. Repeat steps 9 through 11, until the center frequency reaches 3.4 GHz.

Calculating the maximum deviation

13. Subtract the minimum value from the maximum value (found on the performance check sheet) to calculate the maximum deviation.

5.2.2 Output Level Accuracy

This section describes how to check Tacking Generator's output level accuracy.
connect the power sensor to the TG output connector to measure the output level, when the tracking generator's output frequency is set to 30 MHz, and output level is set to -10 dBm.

Specifications: < ±1 dB (at 30 MHz and -10 dBm Output)

Instruments Required

Instruments	QTY	Recommended Model
Power meter / Power sensor	1	NRVS / NRV-Z52
Adapter N(m)-SMA(f)	1	

Initializing the power meter

1. Set the display mode of the NRVS to dBm.
2. Perform the zeroing on the NRVS.

Setup

3. Connect the power sensor, which has the adapter already attached, to the TG OUTPUT connector.

Initialization

4. Press **SHIFT** and **CONFIG(PRESET)**.

Setting the measurement conditions

5. Press **TG, *Output Level*, 1, 0** and **MHz(-dBm)**.
6. Press **SPAN, 0** and **MHz**.

7. Press **FREQ, 3, 0** and **MHz**.

Measurements

8. set the correction frequency of the NRVS to 30 MHz.

9. Fill in the performance check sheet with the power value measured by the NRVS.

5.2.3 Output Spurious (Harmonics)

This section describes how to check the TG (Tracking Generator) output spurious.
Connect the spectrum analyzer to the TG output connector to obtain the harmonics level-output frequency characteristics of the tracking generator.

Specifications: < -15 dBc (at 0 dBm Output)

Instruments Required

Instruments	QTY	Recommended Model
Spectrum Analyzer	1	R3267
RF Cable SMA(m)-SMA(m)	1	A01002
Adapter N(m)-SMA(f)	2	

Initialing the R3267 (instrument)

1. press **SHIFT** and **CONFIG(PRESET)** to initialize the instrument.

2. Press **LEVEL, 0** and **MHz(-dBm)**.

Setup

3. Connect the RF Cable, which has the adapter already connected, from the TG OUTPUT connector to the INPUT connector of the R3267.

Initialization

4. Press **SHIFT** and **CONFIG(PRESET)**.

Setting the measurement conditions

5. Press **TG, *Output Level*, 1, 0** and **MHz(-dBm)**.

6. Press **SPAN, 0** and **MHz**.

7. Press **FREQ, 0** and **MHz**.

8. Press **FREQ, *CF Step Size AUTO/MNL***(MNL), **3, 0, 0** and **MHz**.

Measurements

9. Press **FREQ** and △.

10. Tune the center frequency of the R3267 to the frequency 1.5 times higher than the TG output frequency.
(Example: when TG is 100 MHz, the center frequency is 150 MHz)

11. Tune the span frequency of the R3267 to the frequency width 2 times wider than The TG output frequency.
(Example: when TG is 100 MHz, the span frequency is 200 MHz)

12. Turn on the marker (on the R3267), and tune the marker to the output frequency on the tracking generator.

13. Change the marker mode to Delta mode (on the R3267), and tune the marker to the frequency twice the TG output frequency (or the second-order harmonic).

14. Fill in the performance check sheet with the delta marker value displayed on the R3267.

15. Repeat steps 9 through 14, until the center frequency reaches 3.4 GHz.

5.2.4 Output Spurious (Non-harmonics)

This section describes how to check the TG (Tracking Generator) output spurious (non-harmonics). Connect the spectrum analyzer (instrument) to the TG output connector to obtain the harmonic level-output frequency characteristics of the tracking generator.

Specifications: < -25 dBc (at 0 dBm Output)

Instruments Required

Instruments	QTY	Recommended Model
Spectrum Analyzer	1	R3267
RF Cable	1	A01002
Adapter N(m)-SMA(f)	2	

Initializing the spectrum analyzer (instrument used)

1. Press **SHIFT** and **CONFIG(PRESET)** to initialize the R3267.

2. Press **LEVEL, 0** and **MHz(-dBm)** to set the reference level to 0 dBm.

3. Press **SPAN** and **Full Span** to set the full span.

Setup

4. Connect the RF Cable, which has the conversion adapter already attached, from the TG OUTPUT connector to the INPUT connector of the R3267.

Initialization

5. Press **SHIFT** and **CONFIG(PRESET)**.

Setting the measurement conditions

6. Press **TG, *Output Level*, 1, 0** and **MHz(-dBm)**.
7. Press **SPAN, 0** and **MHz**.
8. Press **FREQ, 0** and **MHz**.
9. Press ***CF Step Size AUTO/MNL***(MNL), **3, 0, 0** and **MHz**.

Measurements

10. Press **FREQ** and △.
11. Turn on the marker (on the R3267), and tune the marker to the output frequency on the tracking generator.
12. Change the marker mode to Delta mode (on the R3267), and search for a spurious signal using Next Peak mode in the peak search function.
13. Fill in the performance check sheet with the delta marker value on the R3267.
14. Repeat Steps 10 through 13 until the center frequency reaches 3.4 GHz.

5.2.5 Vernier Accuracy

This section describes how to check TG (Tracking Generator) vernier accuracy.
Connect the power sensor to the TG output connector to measure the change in the output level, when the TG output frequency is set to 30 MHz, and the output level is set to a value between -10 dBm and 0 dBm.

Specifications: < 0.5 dB/1 dB (at 30 MHz and output between 0 dBm and -10 dBm)

Instruments Required

Instruments	QTY	Recommended Model
Power meter / Power sensor	1	NRVS / NRV-Z52
Adapter N(m)-SMA(f)	1	

Initializing the power meter

1. Set the display mode of the NRVS to dBm.
2. Perform the zeroing on the NRVS.
3. Set the correction frequency of the NRVS to 30 MHz.

Setup

4. Connect the adapter from TG OUTPUT connector to NRV-Z52(Power sensor).

Initializing the settings

5. Press **SHIFT** and **CONFIG(PRESET)**.

Setting the measurement conditions

6. Press **FREQ, 3, 0** and **MHz**.
7. Press **SPAN, 0** and **MHz**.
8. Press **LEVEL,** ***dB/div*** and ***1dB/div***.

Measurements

9. Press **TG,** ***Output Level*****, 1, 0** and **MHz(-dBm)**.
10. Fill in the performance check sheet with power measurement values measured by the NRVS.
11. Press △ key.
12. Fill in the performance check sheet with power measurement values measured by the NRVS.

Calculating the vernier accuracy

13. Calculate the vernier accuracy using the current and previous measured values by the power meter, and fill it in on the performance check sheet.
    Vernier accuracy = Current value - previous value -1
14. Repeat Step 11 to 13 until the output from the TG reaches 0 dBm, this allowing all vernier accuracies to be checked.

5.2.6 TG Leakage

This section describes how to check the TG leakage.
The leakage level between the output of the tracking generator and the input of the spectrum analyzer is measured, using spectrum analyzer's marker function.

5.2.6 TG Leakage

Specifications: < -110 dBm (100 kHz to 3 GHz)

< -100 dBm (3 GHz to 3.6 GHz)

Instruments Required

Instruments	QTY	Recommended Model
Terminator	2	RNA

Setup

1. The TG OUTPUT and INPUT connectors are terminated with a terminator.

Initializing the settings

2. Press **SHIFT** and **CONFIG(PRESET)**.

Setting the measurement conditions

3. Press **TG, *Output Level*, 0** and **MHz(-dBm)**.
4. Press **SPAN, 0** and **MHz**.
5. Press **ATT** and ***Min ATT ON/OFF***(OFF).
6. Press ***ATT AUTO/MNL***(MNL), **0** and **GHz(dB)**.
7. Press **LEVEL, 6, 0** and **MHz(-dBm)**.
8. Press **FREQ, *CF Step Size AUTO/MNL***(MNL), **3, 0, 0** and **MHz**.
9. Press **COUPLE, *RBW AUTO/MNL***(MNL), **3, 0** and **Hz**.
10. Press ***VBW AUTO/MNL***(MNL), **1** and **Hz**.
11. Press **MKR**.

Measurements

12. Press **FREQ, 1, 0, 0** and **MHz**.
13. Fill in the performance check sheet with the marker level.
14. Press **FREQ** and △.
15. Fill in the performance check sheet with the marker level.
16. Repeat Steps 12 and 13 until the center frequency reaches 3.4 GHz.

5.3 Performance Verification Check Sheet

5.3.1 Output Level Flatness

Table 5-2 Output Level Flatness Check Sheet (Measured value)

Setting TG Output frequency MHz	Measured Output level dBm	Remarks
100		
400		
700		
1000		
1300		
1600		
1900		
2200		
2500		
2800		
3100		
3400		

Table 5-3 Output Level Flatness Check Sheet (Calculated Value)

Max. deviation	Sepc.(Min.) dB	Spec.(Max.) dB	Calculated value	Remarks
Max. value - Min. value	- 3	+ 3		

5.3.2 Output Level Accuracy

Table 5-4 Output Level Accuracy Check Sheet

Settings	Sepc.(Min.) dBm	Spec.(Max.) dBm	Measured value	Remarks
30 MHz, -10 dBm	- 11	-9		

5.3.3 Output Spurious (Harmonics)

Table 5-5 Output Spurious (harmonics) Check Sheet

Setting TG Output frequency MHz	Spec.(Min.) dBc	Spec.(Max.) dBc	Measured value Harmonics level dBc	Remarks
100	-	-15		
400	-	-15		
700	-	-15		
1000	-	-15		
1300	-	-15		
1600	-	-15		
1900	-	-15		
2200	-	-15		
2500	-	-15		
2800	-	-15		
3100	-	-15		
3400	-	-15		

5.3.4 Output Spurious (Non-harmonics)

Table 5-6 Output Spurious (Non-harmonics) Check Sheet

Setting TG Output Frequency MHz	Spec.(Min.) dBc	Spec.(Max.) dBc	Measured value Harmonics frequency MHz	Measured value Harmonics level dBc	Remarks
100	-	-25			
400	-	-25			
700	-	-25			
1000	-	-25			
1300	-	-25			
1600	-	-25			
1900	-	-25			
2200	-	-25			
2500	-	-25			
2800	-	-25			
3100	-	-25			
3400	-	-25			

5.3.5 Vernier Accuracy

Table 5-7 Vernier Accuracy Check Sheet

Setting TG Output Level dBm	Measured value dBm	Vernier accuracy			Remarks
		Spec.(Max.) dB	Spec.(Min.) dB	Calculated value	
-10		-	-	-	
-9		-0.5	+0.5		
-8		-0.5	+0.5		
-7		-0.5	+0.5		
-6		-0.5	+0.5		
-5		-0.5	+0.5		
-4		-0.5	+0.5		
-3		-0.5	+0.5		
-2		-0.5	+0.5		
-1		-0.5	+0.5		
0		-0.5	+0.5		

5.3.6 TG Leakage

Table 5-8 TG Leakage Check Sheet

Setting TG Output Frequency MHz	Spec.(Min.) dBm	Spec.(Max.) dBm	Measured value Leakage level dBm	Remarks
100	-	-110		
400	-	-110		
700	-	-110		
1000	-	-110		
1300	-	-110		
1600	-	-110		
1900	-	-110		
2200	-	-110		
2500	-	-110		
2800	-	-110		
3100	-	-100		
3400	-	-100		

6 SPECIFICATIONS

Tracking Generator Specifications

Characteristics	Specifications
Output frequency range	100 kHz to 3.6 GHz (START FREQ < 3.5GHz)
Output amplitude	
Range	
OPT74	0 dBm to -50 dBm
OPT79	0 dBm to -10 dBm
Set resolution	0.1 dB
Output level flatness	< ±3 dB (100kHz to 3.6 GHz, Relative value)
Output level accuracy	< ±1 dB (30MHz, -10 dBm, 25°C ±10°C)
Vernier accuracy	< ±0.5 dB/1dB
Sweep range	
OPT74	(0dBm to -10 dBm)-ATT (ATT = 0 dB to 40 dB/10 dB Step)
OPT79	0 dBm to -10 dBm
Output spurious	
Harmonics	< -15 dBc (at 0 dBm output)
Non harmonics	< -25 dBc (at 0 dBm output)
TG Leakage	
100 kHz to 3.0 GHz	< -110 dBm
3.0 GHz to 3.6 GHz	< -100 dBm
TG Output	
Impedance	50Ω (nominal)
VSWR	(nominal at -10 dBm output)
OPT74	< 2.0 (100 kHz≤ f ≤3.6 GHz)
OPT79	< 2.0 (100 kHz≤ f ≤3.0 GHz), < 3.0 (3.0 GHz< f ≤3.6 GHz)

APPENDIX

A.1 Error Message

In this section, the error messages that are displayed while the analyzer is being used are described.

Code	Error massage	Remarks
310	No TG signal detected. Check TG OUTPUT signal.	No TG signal is detected. Check the output signal at the TG OUTPUT connector.
311	Level Cal failed. Check connection between TG OUTPUT and INPUT.	Level Cal has not normally completed. Check to see that the cable between the TG OUTPUT and INPUT connectors is connected correctly.
312	TG Power Sweep Cal failed. Check connection between TG OUTPUT and INPUT.	Power Sweep Calibration has not normally completed. Check to see that the cable between the TG OUTPUT and INPUT connectors is connected correctly.
313	Through Correction failed. Check connection between TG OUTPUT and INPUT.	Through Correction has not normally completed. Check to see that the cable between the TG OUTPUT and INPUT connectors is connected correctly.
314	Invalid Level Cal data. Execute TG Level Cal.	No Level calibration data is found. Execute Level Calibration.
315	Invalid Power Sweep Cal data. Execute TG Power Sweep Cal.	No Power Sweep Calibration data is found. Execute Power Sweep Calibration.
316	Invalid Through Correction data. Execute Through Correction.	No Through Correction data is found. Execute Through Correction.
317	TG frequency out of range.	
320	Px dB point not found.	No Px dB point has been detected.
810	Preselector set to 3.6 GHz.	Preselector has been set to 3.6 GHz.

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